

CHAPTER IV MONITORING PROGRAM, SCOPE AND METHODOLOGY

A. FIELD MORPHOMETRY

1. Station Locations and Descriptions

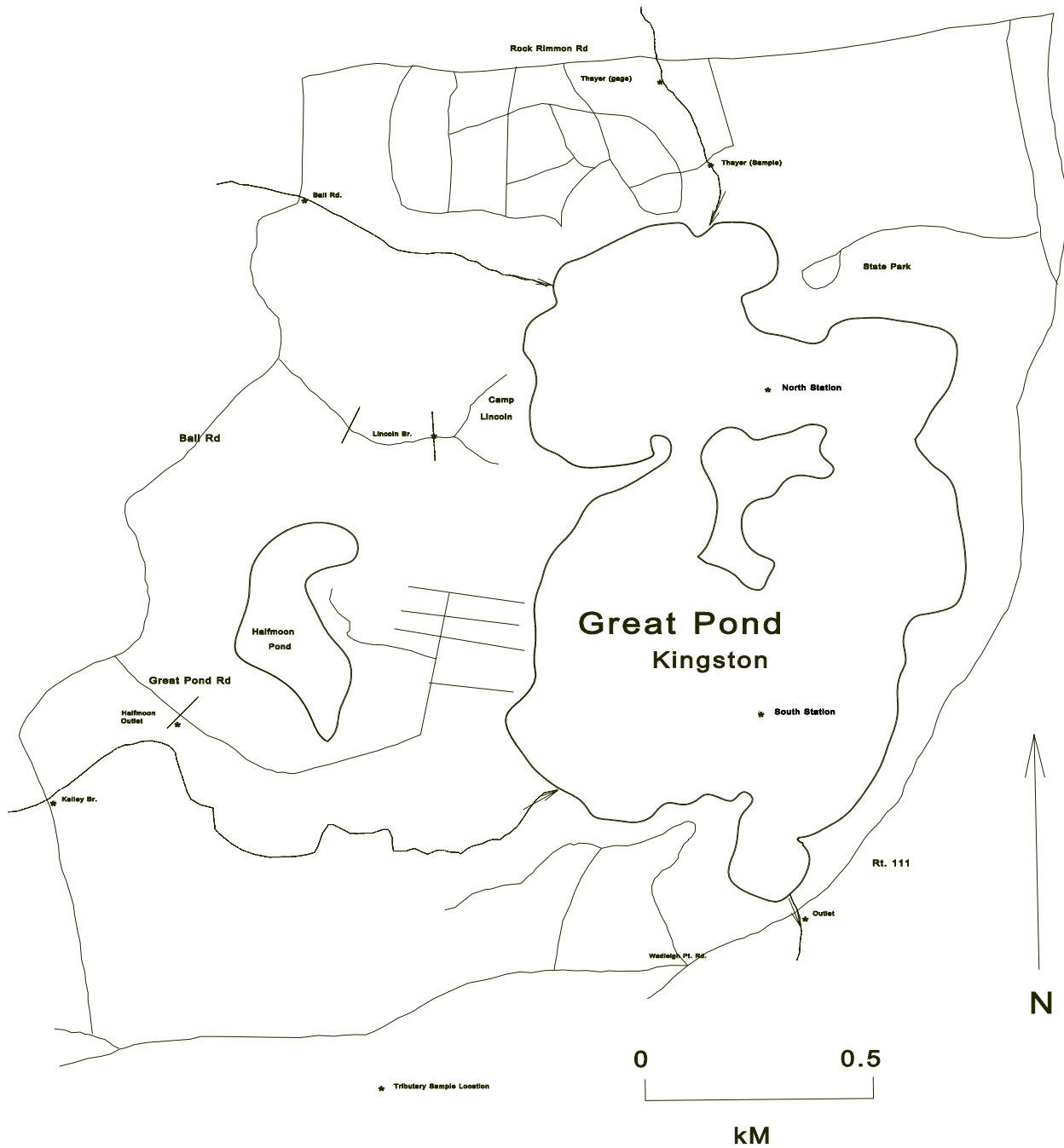
Sampling locations, depicted in Figure IV-1, were chosen to include all inlets and outlets. Table IV-1 presents a brief description of each tributary sample station. Two lake quality monitoring stations were established at the two deepest sections of Great Pond (13 meters in both cases). The North Station, and South Station were sampled at one third and two thirds of the water depth during the unstratified season, and at three depths during the stratified season. Lake quality, in general, varied with depth, reflecting different density layers characteristic of dimictic lakes.

Table IV-1
Description of Sampling Stations

Station # & Site Name	Site Description
1. Thayer Inlet	Northern end of pond. Drains Greenwood Pond.
2. Bartlett Beach Inlet	Seasonal tributary on northern end of pond. Drains wetland.
3. Ball Road Inlet	Northwestern end of pond. Drains wetland complex.
4. Camp Lincoln	Seasonal tributary on access road to Camp Lincoln. Drains wetland.
5. Halfmoon Outlet	Drains Halfmoon Pond. Runs into Kelley Brook. Sampled at culvert under Great Pond Rd.
6. Kelley Brook	A.K.A. Powwow River. The major tributary in Great Pond watershed, drains Long Pond.
8. Outlet	Southern end of pond. Downstream of Rt. 111 bridge. Regulated by dam.
9. Deep Spot (North Station)	North of island, at 13 meters.
10. Deep Spot (South Station)	South of island, at 13 meters.

The lake has one major tributary, several minor and seasonal tributaries, and one outlet. The major tributary, Kelley Brook, feeds into the lake at its southwest corner through a large wetland and collecting runoff from 3513 acres of watershed. The tributary drains Long Pond in Danville then is impounded and used for power by a saw mill. Downstream of the mill, it passes

through several wetlands before entering Great Pond. The tributary is culverted as it passes



under Ball Road more than a half mile from the lake, which provides the closest convenient sampling and gaging point to the lake.

The next largest drainage area, at 1069 acres, is the Ball Road tributary subwatershed. Ball Road inlet drains a large wetland complex in the vicinity of Rock Rimmon State Forest, helping to buffer effects from the urban and agricultural development that lay upstream.

The remaining tributaries are seasonal and have watershed areas considerably less than 1000 acres. Thayer Brook drains Greenwood Pond and has a subwatershed area of 491 acres. The brook was sampled from a culvert that runs under Thayer Road before emptying into Great Pond. However, this location was unsuitable for a staff gage and flow measurement due to lake level influence. As a result, a gage was located in Thayer Brook just off of Rock Rimmon Road. Halfmoon outlet drains Halfmoon Pond via wetlands and a culvert into the large wetland that forms the mouth of Kelley Brook. Halfmoon Pond Outlet had to be monitored separately, because there was not convenient monitoring point in Kelley Brook beyond the Ball Road culvert.

2. Lake Field Procedures

Lake stations were sampled monthly from November 1994 through November 1995, with the exception of the summer of 1995. Through a cooperative effort by NHDES and volunteers from Great Pond Citizens Advisory Committee (C.A.C.), lake stations were sampled weekly from June to early September.

Temperature and dissolved oxygen were measured at one meter intervals using a YSI model 50, 54 or 57 dissolved oxygen meter during open water periods, and hypolimnetic dissolved oxygen was measured using the Winkler method (azide modification) during the ice-cover period. Temperature was recorded to the nearest 0.1 degree Celsius. Dissolved oxygen was recorded to the nearest 0.1 mg/L.

Water samples were collected with a Wildco Kemmerer water sampler. All samples were preserved according to EPA Standard Procedures. Samples were stored in a cooler and immediately returned to the NHDES laboratories in Concord, New Hampshire for analysis.

Transparency was measured to the nearest 0.1 meter using a 20 centimeter Secchi disk

with alternate white and black quadrants. Net phytoplankton and zooplankton were collected by hauling an 80 micron mesh net vertically from the thermocline to the surface. One plankton sample was preserved in the field with Lugol's solution, a second was returned live to aid in species identification. Chlorophyll-a samples were collected with an integrated water sampler (a weighted 1" ID tube), or by compositing Kemmerer samples from successive depths to the thermocline.

3. Stream Field Procedures

The tributary stations were sampled at least once every two weeks from November 1994 through November 1995. Staff gage measurements were recorded weekly by volunteers from the Great Pond C.A.C. Flow measurements were taken during ice-out conditions using a Marsh McBirney FlowMate 2000 flow meter. Samples were collected by dipping laboratory bottles to mid-depth at mid-stream in flowing water. Table IV-2 summarizes the sampling parameters for the Great Pond Study.

Table IV-2
Sampling Parameters for Great Pond Study

Parameter:	Location:	Parameter:	Location:
Specific Conductance	Lake and Streams	pH	Lake and Streams
Transparency	Lake	Chlorides	Lake and Streams
Acid Neutralizing Capacity	Lake and Streams	Color	Lake and Streams
Total Phosphorus	Lake and Streams	Sulfates	Lake and Streams
Nitrate Nitrogen	Lake and Streams	Chlorophyll-a	Lake
Temperature/Dissolved Oxygen	Lake	Plankton	Lake

4. Groundwater Seepage Field Procedures

Groundwater seepage into the lake was measured at least twice a month during the

growing season at 11 locations around the shoreline of Great Pond. Seepage meters were constructed using the top and bottom thirds of 55 gallon drums (Connor, 1979). A cork with rigid tubing was inserted into the flat end portion so that a plastic whirl pack, cork, and tubing could be attached (see Figure IV-2). After one hour, the plastic whirl packs were removed, and the amount of seepage was measured and recorded.

An interstitial pore water sampler (IPWS) was used to collect groundwater for chemical analysis. See Figure IV-3 for a description of this specialized sampler. Interstitial pore water samples (IPWS) were collected at the 11 seepage meter locations within the lake. Figure IV-4 indicates seepage meter/IPWS locations.

Six volunteers were solicited by the Great Pond C.A.C. with shallow wells in different locations around the lake. Samples from these wells were taken and analyzed for phosphorus periodically during the summer of 1995. Figure IV-5 indicates well locations

5. Sediment Analysis

Sediment cores were taken at both lake stations using a Wildco KBtm coring device. Samples were analyzed for recoverable Al, Cd, Cu, Fe, Pb, Mg, Zn and P. A complete description of sediment analysis techniques and results appears in Chapter IX.

B. LABORATORY METHODOLOGY

1. Chemical and Physical

Table IV-3 presents the laboratory methods utilized for chemical and physical parameters. Acid neutralizing capacity, pH, specific conductance, and color analyses were performed by biologists in the DES Limnology Center. Chloride, sulfate, total phosphorus, nitrate nitrogen, and total Kjeldahl nitrogen analyses were performed by the DES Laboratory Services Unit. Both the Limnology Center and the Laboratory Services Unit are EPA inspected with approved quality assurance and quality control programs.

2. Biological

Table IV-3 also presents the laboratory methods utilized for biological parameters. All

analyses were performed by biologists in the Limnology Center. Phytoplankton and zooplankton were identified to genus. Relative abundance was computed for both net phytoplankton and zooplankton. Zooplankton and phytoplankton densities were also determined. Chlorophyll-a measurements were used to determine algal biomass.

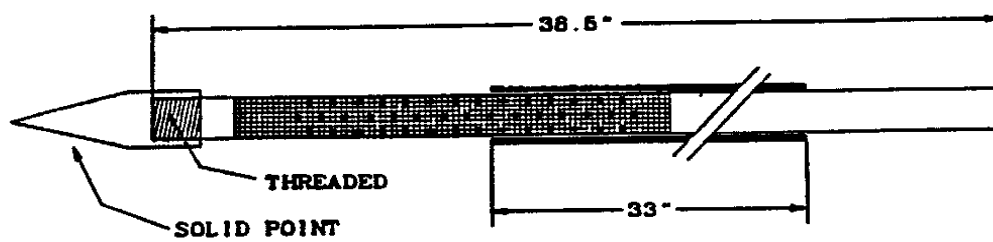
Table IV-3
Laboratory Parameters and Methods Used for Analysis

Parameter:	Method:
pH	Electrometric
Acid Neutralizing Capacity	Titration, Electrometric, Granplot
Total Phosphorus	Colorimetric, Persulfate, Digestion **365.2 *PQL 0.001 mg/L
Specific Conductance	Wheatstone Bridge Type Meter
Apparent Color	Colorimetric, Platinum-cobalt
Chloride	Ion Chromatography **300.0 *PQL 2mg/L
Sulfate	Ion Chromatography **300.0 detection limit 0.5mg/L
Nitrate Nitrogen	Ion Chromatography **300.0 *PQL 0.05mg/L
Total Kjeldahl Nitrogen	Auto-Analyzer with Block Digester **351.2 *PQL 0.10mg/L
Net Phytoplankton (relative abundance)	Phase Contrast Microscopy, Sedgwick-Rafter Cell
Zooplankton (density counts)	Phase Contrast Microscopy, Sedgwick-Rafter Cell
Wholewater Phytoplankton	Inverted Microscope, Settling Chamber
Chlorophyll-a	Spectrophotometric, Trichromatic
Total Coliform MF, MPN	**SM-909A, 908A
Fecal Coliform MF, MPN	**SM-909C, 908C

*PQL = Practical Quantitation Level

**EPA Method

INTERSTITIAL PORE WATER SAMPLER INNER/OUTER SLEEVE DETAIL



SECTION:

INSIDE TUBE:
5/16" ID; 1/2" OD

OUTER TUBE:
9/16" ID; 11/16" OD

SCALE: 1" = 1"

BRASS SCREEN:
250 micron
mesh

HOLES:
1/16" dia.



HOLE
DETAIL

SCALE:
1" = 1"

POINT DETAIL

Great Pond

Kingston

